

REMARKS

Claims 1-11 are pending in the application. Independent claims 1, 4, and 9 have been amended by the present amendment. The amendments are fully supported by the application as originally filed (see, e.g., specification at paragraphs 0077-0087 and 0091-0093).

As amended, independent claim 1 (see also independent claims 4 and 9) recites a graphic processing apparatus in which a hidden surface removal and shadowing processing section is used to obtain a coordinate region that is positioned behind front-facing shadow polygons and in front of back-facing shadow polygons, and where:

processing of the back-facing shadow polygons includes obtaining the depth value of each pixel of the back-facing shadow polygons, comparing the depth value with a corresponding Z value obtained from the Z-buffer memory, and if the depth value is equal to or greater than the corresponding Z value, then the pixel is processed as the back-facing shadow polygon, and

processing of the front-facing shadow polygons includes obtaining the depth value of each pixel of the front-facing shadow polygons, comparing the depth value with a corresponding Z value obtained from the Z-buffer memory, and if the depth value is smaller than the corresponding Z value, then the pixel is processed as the front-facing shadow polygon,

such that the pixels are identified and provided with color representing the shadow if the pixels are associated with a front-facing shadow polygon in front of one of the normal polygons, and a back-facing shadow polygon in back of another of the normal polygons.

According to the Applicant's claimed invention, processing of back-facing shadow polygons includes obtaining a depth value of each pixel, which is compared with a corresponding Z value, such that if the depth value is equal to or greater than the Z value, the pixel is processed as part of a back-facing shadow polygon (see, e.g., paragraphs 0077-0083 of the specification).

As claimed, processing of front-facing shadow polygons includes obtaining a depth value of each pixel, which is compared with a corresponding Z value, such that if the depth value is less than the Z value, then further processing of the pixel as part of a front-facing shadow polygon is carried out (see, e.g., paragraphs 0084-0087 of the specification).

As recited in independent claims 1, 4, and 9, the pixels are identified and provided with color representing the shadow if the pixels are associated with a front-facing shadow polygon that is in front of one of the normal polygons, and a back-facing shadow polygon that is in back of another of the normal polygons. In other words, the pixels (specifically, coordinates of the pixels) are identified that meet the above two conditions, and an appropriate region is shadowed (see, e.g., paragraphs 0091-0093 of the specification).

U.S. Patent No. 6,744,430 to Shimizu (hereinafter "Shimizu") does not teach or suggest that back-facing shadow polygons and front-facing shadow polygons are processed in the above claimed manner, in particular that:

processing of the back-facing shadow polygons includes obtaining the depth value of each pixel of the back-facing shadow polygons, comparing the depth value with a corresponding Z value obtained from the Z-buffer memory, and if the depth value is equal to or greater than the corresponding Z value, then the pixel is processed as the back-facing shadow polygon, and

processing of the front-facing shadow polygons includes obtaining the depth value of each pixel of the front-facing shadow polygons, comparing the depth value with a corresponding Z value obtained from the Z-buffer memory, and if the depth value is smaller than the corresponding Z value, then the pixel is processed as the front-facing shadow polygon,

such that the pixels are identified and provided with color representing the shadow if the pixels are associated with a front-facing shadow polygon in front of one of the normal polygons, and a back-facing shadow polygon in back of another of the normal polygons.

The Shimizu reference is directed to volume rendering, but does not teach or suggest the Applicant's claimed shadowing technique in which polygons are divided into front-facing shadow polygons and back-facing shadow polygons, and in which processing of the front-facing and back-facing shadow polygons is carried out in the claimed manner.

As stated in Finding of Fact (FF) #4 of the Decision on Appeal dated 01/25/2011, a pixel sorter 65 of Shimizu rearranges pixel data in Z value order, where the pixel data includes a polygon ID, polygon attribute information, screen coordinates, Z values, etc. (see column 11, lines 25-36 of Shimizu). Further, as stated in FF #3, region buffers 130-1 to 130-n store information as to whether something is inside or outside a volume (see column 18, lines 10-12 of Shimizu). A layer-by-layer approach is used in Shimizu to output "the polygon ID positioned foremost for each pixel" (see column 21, lines 26-28 of Shimizu).

However, there is no teaching or suggestion in Shimizu of processing front-facing and back-facing polygons in the above claimed manner, as recited in independent claims 1, 4, and 9.

For at least the reasons discussed above, the Shimizu reference does not anticipate or otherwise render obvious the Applicant's claimed invention. Therefore, independent claims 1, 4, and 9 and their respective dependent claims are patentable over Shimizu.

It is believed the application is in condition for immediate allowance, which action is earnestly solicited.

Respectfully submitted,

/Steven M. Jensen/

Date: March 25, 2011

Steven M. Jensen
(Reg. No. 42,693)
Edwards Angell Palmer & Dodge
P.O. Box 55874
Boston, MA 02205

Phone: (617) 517-5531

Customer No. 21874